Energy networks – how can Net Zero and future climate challenges be jointly addressed?

Description

In this guest post, Overhead Line Engineer at SSEN Transmission, Benjamin Brint, talks about the work of Scottish and Southern Electricity Networks (SSEN) in future-proofing the Scottish power network.

Getting to Net Zero

If the UK is to achieve its Net Zero targets, a large amount of renewable generation must be added to the existing generation mix. Much of the proposed generation, onshore and offshore, is situated in the North of Scotland due to the abundance of suitable locations of high wind and wave yield. This increased generation will create a new need for the transmission of large bulk power flows from the proposed generating capacity to the major demand locations in the south of the country.

The challenge

This generation portfolio is fundamentally mismatched to the existing UK transmission network, which is designed to transfer power from a small number of large power plants in relatively near proximity to existing load centres (areas of major demand). In northern Scotland, the transmission network is particularly sparse and acts as a pseudo distribution system managing power flows between small regional load centres, a single bulk gas-fired power station, and a geographically-dispersed hydroelectric capacity.

Currently it is proposed that an estimated additional capacity of 27 GW will need to be connected to the network by 2030 and 50GW by 2050. This increase in capacity will require significant build of new overhead lines, cables and substations as detailed in the Holistic Network Design published by National Grid ESO. The timescale to complete this build is overtly challenging when compared to the time required to physically reconfigure the existing network, as recognized by the UK Government in their Powering Up Britain Energy Security Plan. In the north of Scotland, this reconfiguration and upgrading of the transmission network rests with Scottish and Southern Energy Networks (SSEN).

Science as a solution

To meet this technical challenge, SSEN Transmission is actively pursuing innovative approaches to the design of these future networks. By the application of meteorological science to all aspects of the network design and subsequent asset management, wide-reaching challenges to existing industry practice and standards have been made.

For example, by using Met Office data and scientific consultancy, SSEN Transmission now have a more realistic and optimised approach (compared to the industry standard) to designing infrastructure to withstand risk from icing. This means they are able to target areas that pose the greatest risk with reinforced infrastructure rather than over-designing the network as a whole. This targeted approach reduces both build costs and associated carbon emissions of construction.

The electricity that can be transmitted through an overhead line conductor is currently governed by static line ratings. These ratings place a conservative limit on the power flow to ensure the temperature

increase induced by the flow of electricity does not cause excessive sag of the conductor, thus avoiding potential danger to objects and vehicles beneath them. In order to design for a worst-case scenario static line rating, conservative weather data is used to calculate the environmental cooling of the conductor, effectively under-utilising the asset for the majority of the time. A dynamic line rating takes real-time and forecasted weather inputs to calculate the environmental cooling experienced by the conductor. By moving to this approach, a reduction in transmission constraint can be expected, which is particularly relevant in periods of high winds when wind energy production is at its highest output.

These science tools and engineering adaptations will avoid over-engineering the grid of tomorrow, allowing for more time and cost-effective delivery of the future grid the UK desperately needs to reach its Net Zero targets. This will be at the same time as ensuring the infrastructure is capable of withstanding the current and future environmental conditions it will have to endure over its life span.

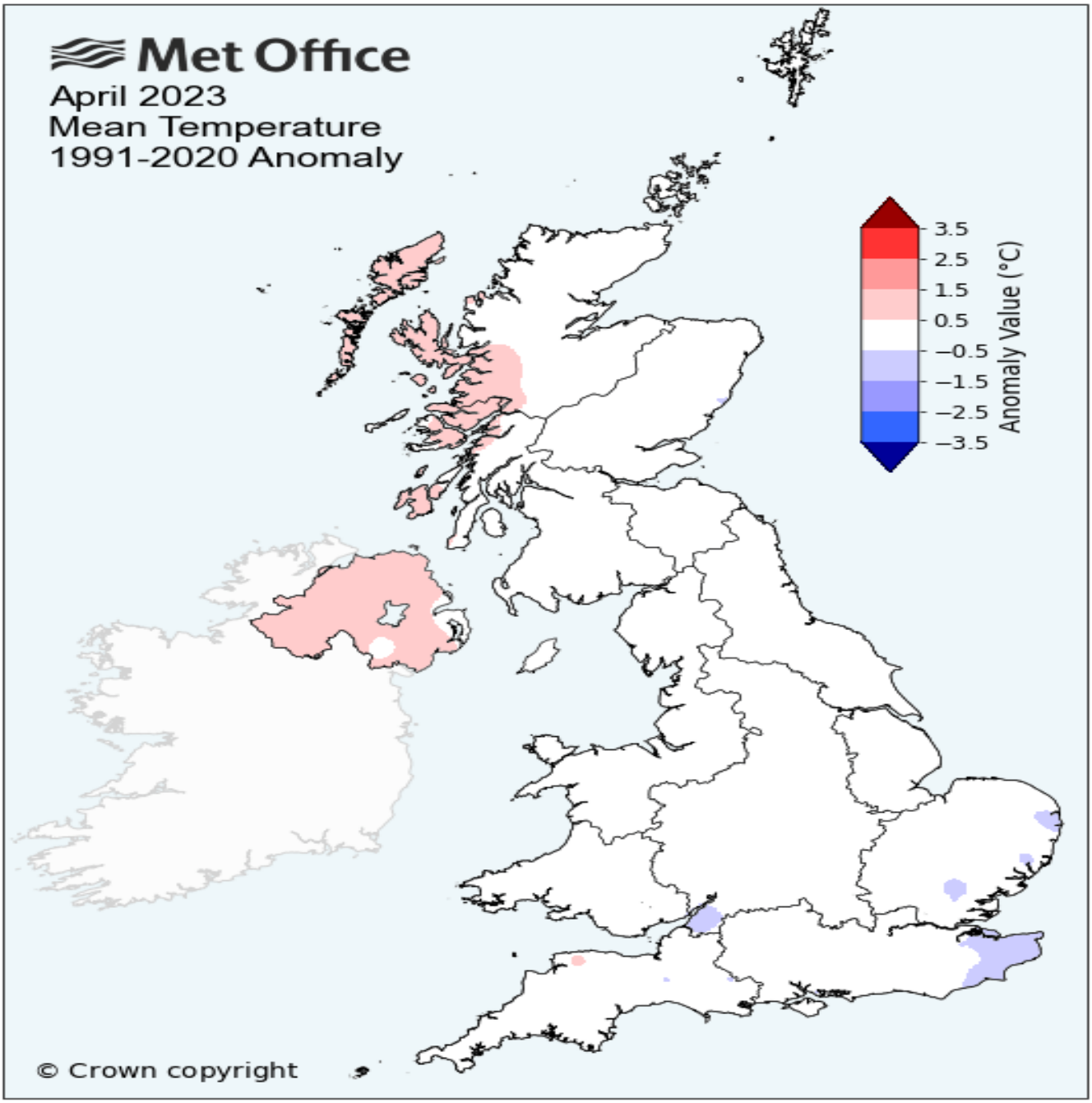
This blog post relates to our April theme of climate change and infrastructure. Learn more on this topic by following #GetClimateReady on Twitter.

Date Created
May 2023

An unsettled April draws to a close.

Description

April was a predominantly unsettled month, with little in the way of consistent warmth, especially over England, and hence the advance of spring seemed to be rather slow, though it was more settled for a time around mid-month, this being followed by a return to rather chilly conditions.

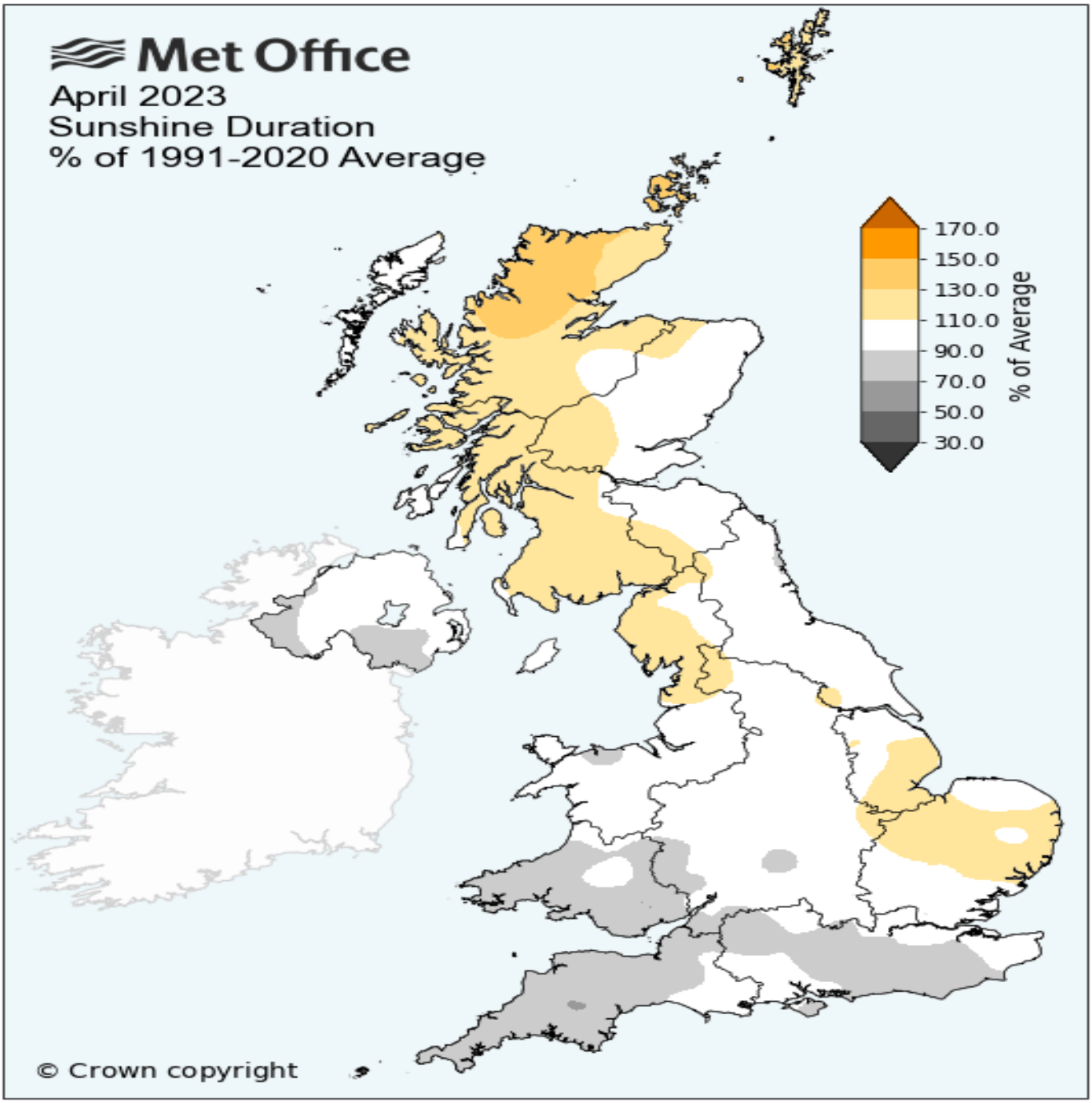


Although, temperatures fluctuated somewhat throughout April the average is close to or a little below average for the month overall, with Northern Ireland warmest relative to average. A milder spell mid-month was balanced by rather colder conditions towards the end of the month.

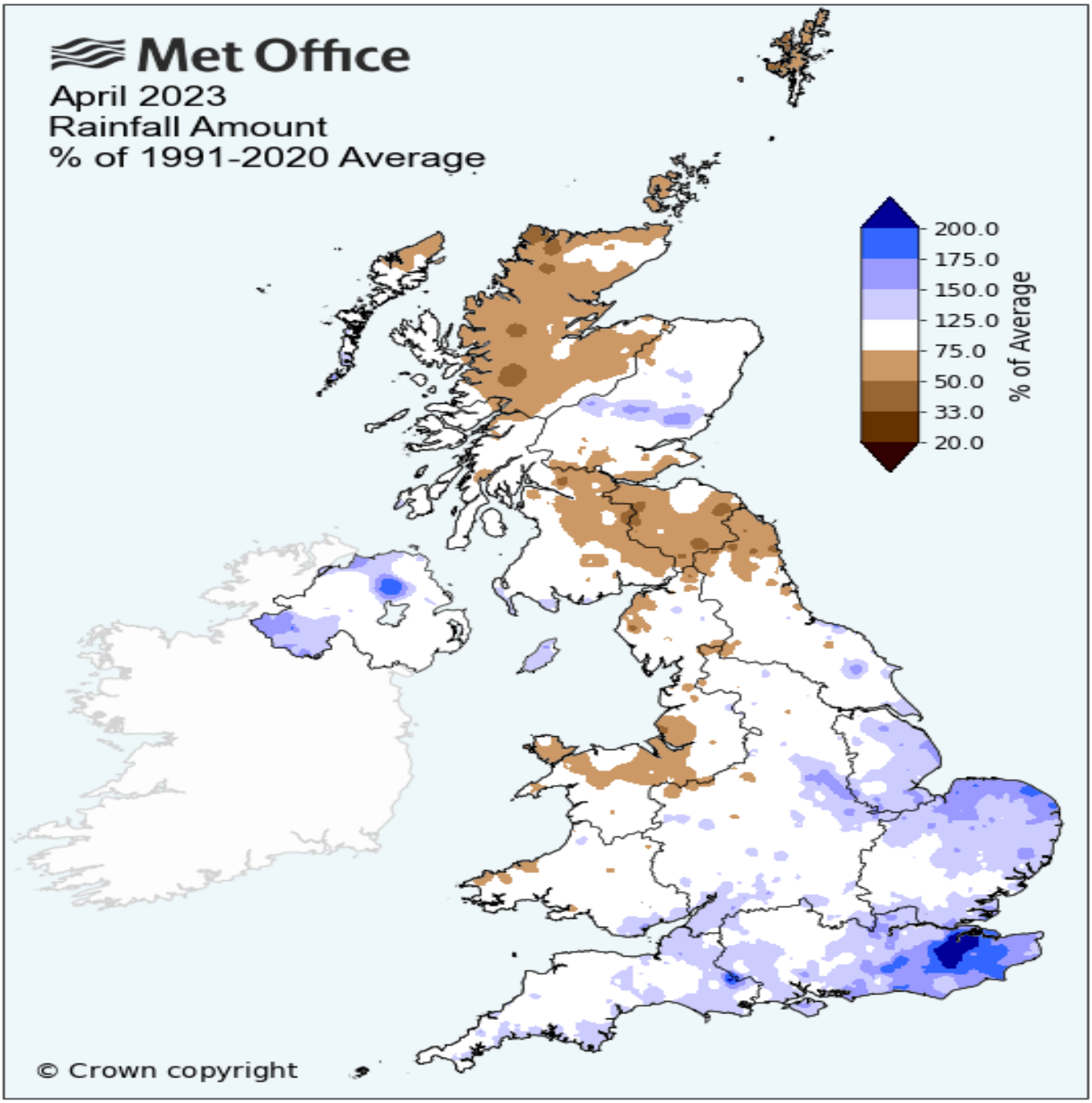
Provisional statistics	Maximum temp °C		Minimum temp °C		Mean temp °C	
April 2023	**Actual**	**1991/2020 Anomaly**	**Actual**	**1991/2020 Anomaly**	**Actual**	**1991/2020 Anomaly**
UK	11.9	-0.1	3.7	-0.1	7.8	-0.1
England	12.6	-0.4	4.2	-0.1	8.4	-0.3
Wales	12.0	-0.2	4.2	0.1	8.1	-0.0
Scotland	10.7	0.4	2.5	-0.2	6.6	0.1
Northern Ireland	12.5	0.5	4.8	0.8	8.6	0.6

Provisional temperature statistic for April 2023

Sunshine was close to normal expectations overall for April, but with the north and east generally brighter relative to average than the south and west.



Rainfall was very close to average overall, but with regional variations, most parts of Scotland being drier than average, but southern and eastern England being rather wet. For example, Kent saw 185% of its average rainfall while West Lothian saw just 59%. At least one weather station in Kent (East Malling) reported more than twice its normal rainfall.



Provisional statistics	Rainfall mm / %		Sunshine hours / %	
April 2023	**Actual**	**1991/2020 Anomaly**	**Actual**	**1991/2020 Anomaly**
UK	69.8	97	158.2	102
England	63.9	114	160.0	98
Wales	77.7	88	142.4	90
Scotland	73.7	79	162.9	115

Provisional statistics	Rainfall mm / %		Sunshine hours / %	
April 2023	**Actual**	**1991/2020 Anomaly**	**Actual**	**1991/2020 Anomaly**
Northern Ireland	89.7	121	137.7	93

Provisional rainfall and sunshine statistics for April 2023

Storm Noa on 12 April 2023 was the second named storm of the 2022/2023 storm season. It was named by Meteo-France and brought widespread gusts of over 58 mph around the coastline of England and Wales. It was an unusually severe storm for the time of year and the most significant April wind storm to affect England and Wales since April 2013. Some weather stations recorded new April wind gust records. For example Isle of Portland (74 mph), St Bee's Head (79 mph) and Shap in Cumbria (67 mph).

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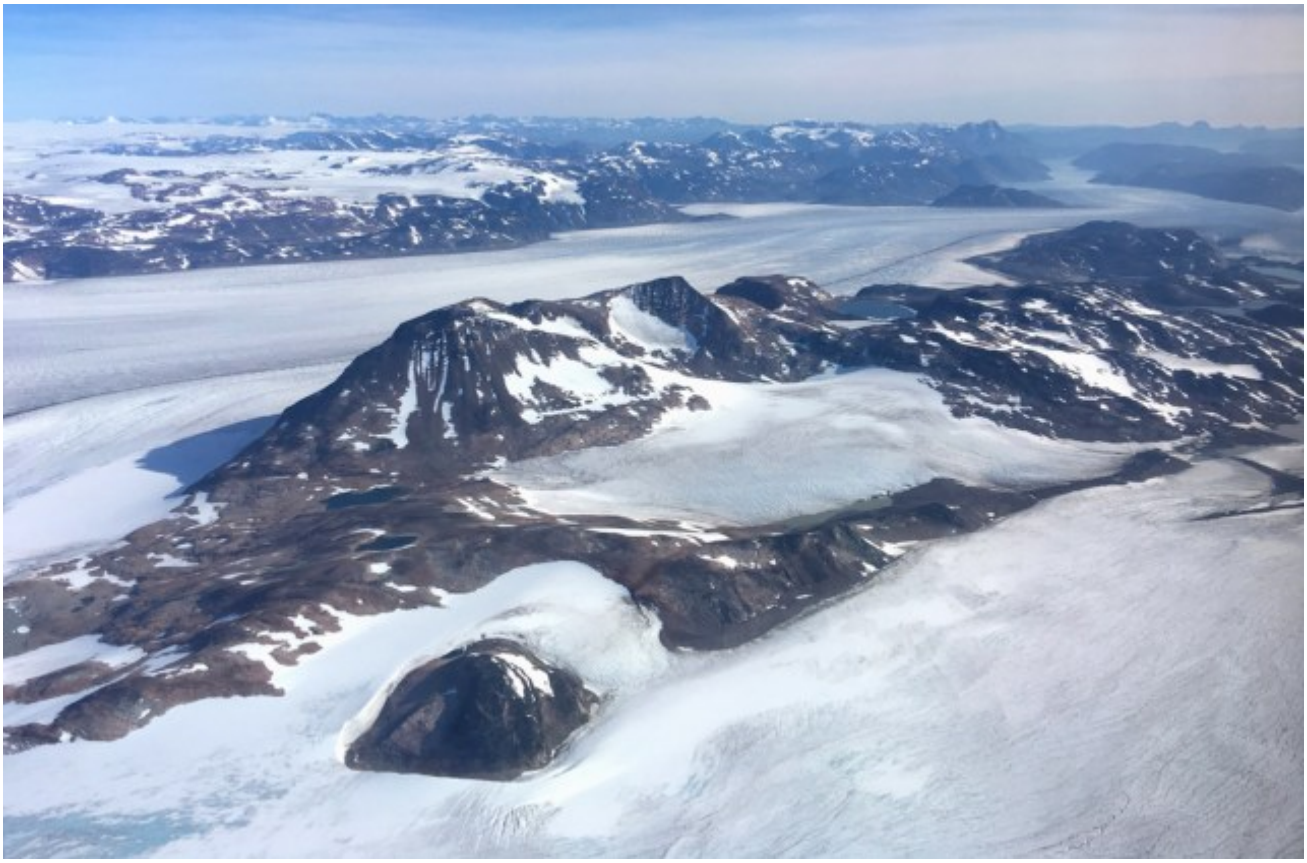
Researchers point the way to managing climate change risks

Description

The consequences of climate change are many and varied. However, most of them bring considerable risk to communities and ecosystems.



Potential collapse of the ice sheets at the poles are a classic example of a high-impact, low-likelihood event. Picture Shutterstock.

Up until now climate scientists across the globe have largely focussed attention on those events most likely to happen, such as the likely levels of rising temperatures, drought and intense rainfall.

But a new paper led by the Met Office's Dr Richard Wood stresses the need for more research into those climate events which are considered less likely to happen, but if they did could unleash even greater impacts. Climate scientists refer to these as 'High-Impact Low-Likelihood' events; or HILL events for short.

Examples of these events include levels of warming or rainfall changes that are at the top end ofwhat's considered plausible. Those events which cross 'tipping points' – such as the collapse of theWest Antarctic Ice Sheet or the breakdown of the Atlantic Meridional Overturning Circulation (AMOC),are also included. AMOC disruption would strongly influence Europe's climate.

The consequences of such changes for the world, Europe and the UK could be profound.

Preparing for the worst impacts

The paper makes several key points:

- Climate outcomes or events that have a high impact are a key component of climate risk, even if their likelihood is low;
- Traditional climate projections that focus on the most likely outcomes are of limited use to inform management of high-impact low-likelihood risks;
- Climate science needs to develop a new set of scientific tools to inform management of high-impact risks.

Professor Rowan Sutton is the Director of Climate Research at the National Centre for Atmospheric Science (NCAS). He said: "As the Covid pandemic has reminded us, the greatest risks sometimes come from hazards that are not the most likely. We mustn't be complacent about the low-likelihood aspect of higher-than-expected levels of climate change, ice sheet collapse, or disruption of ocean circulation. Such changes could create impacts well beyond the scope of current plans for adaptation to climate change."

Dr Wood added: "With HILL events we're talking about things that probably won't happen, but we need to be aware and prepare for the possibility, just in case. Climate scientists are just beginning to develop tools to help society respond to HILL risks: plausible storylines of how climate change could play out, and what the impacts would be; and monitoring and early warning to give time to prepare if these events did happen."

Managing climate risks

In the paper, the authors call for the creation of a HILL-event toolkit for decision makers to develop actions to manage climate risks in their specific sectors. Richard added: "We are potentially vulnerable to HILL events in the UK, but the threats sector-by-sector are different. For example, upland farmers would probably be less worried about the sea level rise impacts stemming from iceshelf melt in the Antarctic. However, all farmers could be exposed to the shutting down of the AMOC ocean circulation which would impose relatively cooler and drier conditions on the UK."

The paper, published in the journal Earth's Future, is supported by a panel of eight other UK and international scientists. UK contributors include: Professor Tim Lenton from the University of Exeter; Crystal Moore from the Environment Agency; Simon Sharpe from University College London; and Professor Rowan Sutton from the National Centre for Atmospheric Science.

Date Created
May 2023

Everything you need to know ahead of summer weather

Description

As all eyes look towards meteorological summer, many people are already speculating about what weather it might bring; long hot summer days or even stormy weather.

Whatever the weather, we at the Met Office and our partners have come together to provide the very best advice and guidance to help everyone to make the most of whatever the summer weather brings and to stay safe and well.

Whether you're planning a big day out or have spotted an ominous forecast, check out our WeatherReady page for advice on preparing for this summer's weather.

Get out and about

Met Office
HM Government
Are you WeatherReady?
Get out and about
Be prepared to get out and about this summer
• Check your vehicle is ready for summer outings
• Get ready to get active
• Check the forecast and make the most of the weather

Being WeatherReady isn't just about cold winter weather. WeatherReady advice includes helpful tips and information on getting out and about safely and making the most of the weather.

This includes advice from expert partners like RNLI and HM Coastguard on beach safety, tips on camping from The Scouts Association and even advice on surviving a festival, courtesy of our very own meteorologist, presenter and festival lover Clare Nasir.

Health and wellbeing

Met Office
HM Government
Are you WeatherReady?
Health and wellbeing
Look after your health and wellbeing this summer
• Be prepared for hot weather
• Check in on elderly or vulnerable neighbours
• Store key information and phone numbers somewhere safe

Last summer's record-breaking heat for the UK was a stark reminder of the risks of extreme heat. Widespread disruption was reported in what was England's joint hottest summer on record, with travel, infrastructure and healthcare impacted by the heat.

Leading health organisations across the UK have contributed to WeatherReady's advice page on hot weather and its impacts. There are plenty of practical steps everyone can take to stay cool during hot weather. This can be especially important for those who are more vulnerable to heat, such as babies, young children and older people.

Find practical advice on UV and sunburn, as well as a wealth of information about hay fever, the pollen season and how you can be prepared for summer conditions.

Home and garden

Met Office
HM Government
Are you WeatherReady?
Home and garden
Prepare your home and garden this summer
• Weatherproof your home and garden
• Consider the impact of heavy rain or strong winds
• Have basic supplies to hand
• Stay cool and hydrated

While many hope for a mild summer with plenty of sunshine, heavy rain can be a factor in summer and it can have a more pronounced impact when it falls on dry land.

WeatherReady includes step-by-step instructions on how to protect a property from flooding, as well as helpful information on how to recover after a flood.

Warm summer weather often carries with it the risk of thunder and lightning, which presents an additional hazard. Knowing what to do when thunder and lightning occurs can help you to stay safe.

Are you WeatherReady?

For more information, practical advice and guidance, visit our WeatherReady website. You can start by finding out 10 things you can do now to prepare for summer.

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Beyond fruit and timber: the many other benefits of trees in today's climate

Description

Native woodland is a really powerful tool to tackle both the nature and climate crises, that is the view of Chris Nichols the Woodland Trust's Conservation Evidence Manager.

Woodland creation or protecting or enhancing existing woodlands are prime examples of what climate experts refer to as co-benefits: where climate mitigation or adaptation can bring wider environmental or societal benefits.

A major factor when trying to counter the increasing concentration of greenhouse gases in the atmosphere is that trees help to sequester carbon; where the plants draw down carbon-dioxide from the atmosphere, locking it away in growing timber.

Chris Nichols added: "It's not just about the creation of new woodland that can help sequester carbon, but it's also about the protection of existing woodland that already have a lot of carbon stored in them. Put together it is about protection, creation and restoration."

As well as helping to keep carbon locked away from the atmosphere native woodlands have important benefits for wildlife and people. Picture Shutterstock

But trees and woodlands have so many more benefits to offer society and the environment. Native

woodland provides benefits for wildlife, with many threatened species needing trees and woodland habitats during their life cycles. An estimated 2,300 species of wildlife are supported by the UK's two native oak species alone.

Additionally, woodlands and trees can provide: shade for people and livestock; recreational opportunities for improving physical health or wellbeing; mechanisms to slow the flow of water through the landscape to reduce flood risk; and opportunities to improve air quality as trees provide green lungs for communities and provide mechanisms to cycle the movement of some pollutants.

Cloak of oak and ash

According to the Woodland Trust's 2021 State of the UK's Woods and Trees report, 13.2% of the UK's land surface is covered by woodland. This is up from 12% in 1998. Historically, of course, much of the UK would have been covered with trees. But over time, the green cloak of oak and ash has been eroded to create space for communities and agriculture.

Chris praises the recent modest increase in tree cover but he feels that targets for woodland recovery could be more ambitious with some areas in the UK having the potential to even reach 30% woodland cover.

Chris believes there are benefits to planting trees wherever the opportunity lies. He said: "Planting or preserving large blocks of trees can have obvious benefits for the climate, the environment, people and wildlife. However, single or small groups of trees have their benefits too. In urban landscapes trees along streets, or in gardens and parks can provide much-needed shade; helping to lower temperatures and protect people from heat and UV.

The purple emperor butterfly is one of the UK’s most attractive woodland butterflies. Picture: Shutterstock

“While in rural landscapes, single trees are recognised as being very valuable to livestock farmers whose stock can seek protection from the sun in otherwise open landscapes.

“And, of course, trees spread out across communities and landscapes provide greater connectivity allowing biodiversity to spread through a potentially otherwise impervious area.”

Trees at risk from climate change

To some extent everything and everyone are exposed to climate change risks, and trees are no exception. The climate is shifting and trees may need encouragement to cope with these changes. Larger blocks of trees will be more resilient. Additionally, harnessing the adaptive potential of the existing high genetic diversity of trees within an area is also valuable. Climate projections may informus about which types of tree will be suitable for different objectives in the future, and this could be a valuable guide to ensuring we add trees to the landscape for the right reason by the right method.

The total amount of carbon in living trees in ancient and long-established woodland across Great Britain is estimated to be 77 million tonnes. If lost this would be a huge addition to the atmosphere, but experts believe that with a range of nature-based solutions, then trees could make an even greater contribution to protecting our climate along with lots of other benefits too.

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May 2023

Is it going to be a long, hot summer?

Description

There is lots of speculation about the potential for up-and-coming heatwaves, extreme temperatures or drought for this summer. The Met Office Contingency Planners 3-Month Outlook is often cited as a source for some of this conjecture, but can it really be used to tell us what the daily weather has in store for the coming months?

What does our three-month outlook say?

There's always a lot of interest in predictions for the summer – how hot will it be, how much rain will we get? Long-range predictions, including the Contingency Planners 3 Month Outlook, are at the cutting edge of meteorological science but are unlike weather forecasts for specific days. We have to acknowledge that the chaotic nature of our atmosphere means it is not possible to predict the weather on any particular day months ahead. With many variables there are unavoidable limitations to what we can predict, particularly during the summer months when the influence of global weather drivers on the UK is small so confidence in Outlooks at this time of year is lower than, say the winter.

Long range forecasts assess global weather patterns and their potential to influence the type of weather in the UK over the course of a season, dry, windy, hot etc. Factors in the global climate system act to make some outcomes more likely than others, because of this we can make a prediction, showing a spread of possible outcomes. We present the likelihood of each outcome using a range or percentages. As a result, this type of forecast assesses likelihood and risk, but does not predict specific weather, such as the dates of a potential heatwave or exactly how high temperatures may reach on any given day.

The Outlook gives the percentage chances of the temperature, rainfall amounts and wind speeds varying from their 3 monthly averages for the UK as a whole. The current Outlook for June, July and August gives a 45% chance of the season will be hot with a 50% chance of it will be near average. Whilst it gives a 65% chance of near average rainfall with a 15% chance of a dry season.

But what do these figures mean for our weather?

The elevated risk of a warmer than average summer this year, is consistent with wider global warming trends and the UK's warming climate, after all, four of the five warmest summers on record for England have occurred since 2003. Nevertheless, looking at the figures you can see a near average summer is also still a possibility.

Whilst there are no strong signals for rainfall this summer, whatever the outcome, figures for the UK as a whole can hide big regional variations. Therefore, even if rainfall turns out to be near average for the country overall, we could still see some localised impacts from heavy rainfall or regional droughts.

What is behind the summer predications?

Even though the influence of global weather drivers on the UK is small during our summer months, there are a few considerations relevant to the current Outlook.

Firstly, long-range prediction centres around the world are in good agreement in their forecast for northern Europe this summer with signals for high pressure to the north of the UK and low pressure to the south. At this time of year, high pressure is usually associated with warmer-than-average weather.

With the waters warming in the tropical Pacific Ocean there is consensus an El Niño will develop later this year. However, while fundamentally important globally, the impacts of El Niño on UK summer conditions are modest.

And finally, there is the global warming trend. The effects of human-induced climate change are already being felt on UK's summer with temperatures in excess of 40C recorded for the first-time last summer and an increase in the frequency, duration, and intensity of extreme heat events over recent decades. Meanwhile, our Global Annual to Decadal Climate Update, issued with the WMO, has stated there is a 98% chance that one of next five years will be the warmest year on record for the globe. Like in every year the chance of temperatures reaching 40C in the UK is very low and our forecasts suggest this is still the case for the coming summer. However, with an increased chance of above average temperatures we are likely to see some very hot days this summer with heatwaves and hot weather impacts are possible.

Why do we produce this type of Outlook?

The science of long-range forecasting is at the cutting edge of meteorology and the Met Office is leading the way in this area. We continue to demonstrate improvements in this type of forecast, identify sources of predictability and build better prediction systems.

The 3-Month Outlook is produced for planners in government and business who make risk-based decisions. These users are aware of the complexities of this type of Outlook and include those factors in their decision-making process. It gives a spread of outcomes based on the more probable prevailing weather patterns giving the percentage risk of each occurring and must be used in the right context. The uncertainties are often quite large but enable businesses and governments to take weather related decisions, make choices with more confidence, and help the economy and population make better decisions to stay safe and thrive.

If you are looking for a clue on what the weather will be like in the coming days or weeks you should check out our 30-day outlook (scroll to the bottom of the homepage) which outlines the general type of weather we're likely to see in the UK over the next month or our 7 day forecast which gives a daily detailed location based forecast and perhaps take any speculation in the media with a good pinch of salt.

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